

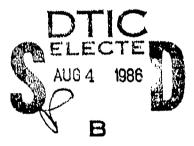
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Report 2427

STATUS OF THE DEVELOPMENT
OF A DATA BASE
TO MONITOR LUBRICATION ORDER/
LUBRICATION INSTRUCTION
DOCUMENTS

Prepared by Charles C. Chapin

14 November 1985



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STATUS OF THE DEVELOPMENT OF A DATA BASE TO MONITOR LUBRICATION ORDER/LUBRICATION INSTRUCTION DOCUMENTS

I. INTRODUCTION

The U.S. Army has hundreds of equipment systems ranging from small operating machines, trucks, and construction equipment to tanks, helicopters, missiles, and watercraft. The lubrication requirements for these systems are contained in Lubrication Orders (LOs), Technical Manuals (TMs), and specifications. Lubrication Orders are prepared under the Military Specification MIL-M-63004, Preparation Instructions for Lubrication Orders, and Army Regulation AR 310-3, Preparation, Coordination, and Approval of Department of the Army Publications. The LOs are meant to be placed in or on the equipment so that lubrication instructions and intervals can be readily followed by maintenance personnel. Lubrication Orders are not used for Army aircraft. Those lubrication instructions are found in the combined Aviation Intermediate Maintenance (AVIM) and Aviation Unit Maintenance (AVUM) Technical Manuals but are often represented by Lubrication Order type lubrication charts. The listing of Army LOs can be found in DA Pam 310-1, Consolidated Index of Army Publications and Blanks Forms. This publication is currently supplied in microfische form and is updated on a quarterly basis.

In 1980, the Fuels and Lubricants Division of the Materials, Fuels, and Lubricants Laboratory began a program to review LOs and lubrication instructions which were then covered by the Army Development and Readiness Command (DARCOM, now AMC) Regulation 750-11, Maintenance of Supplies and Equipment, Use of Lubricants, Fluids, and Associated Products. This regulation now states, "It is the policy of the Army Materiel Command (AMC) to use standard lubricants, fluids, and associated products in all vehicles and/or equipment designed, procured, and used by AMC or any of its subordinate activities. To insure the proper selection of lubricants, fluids, and related products, MIL-STD-838 (Lubrication of Military Equipment) shall be invoked in all equipment design specifications and new procurement documentation. Lubrication Orders and other lubrication instructions shall be coordinated with the U.S. Army Belvoir Research Development and Engineering (RD&E) Center to assure adequacy of product listings and to monitor inclusion of non-standard products."

This statement sets the policy for introducing fluids, lubricants, preservatives, and associated products into the Army supply system and requires that standardized (i.e., military or federal specification) products be used whenever and wherever possible. This project was initiated for the purpose of reviewing the status of the LOs, TMs, and other documentation with respect to: (1) removing references to obsolete specifications, (2) assuring the proper use and application of specification products, and (3) reducing the proliferation of non-standard proprietary products. The Federal Supply System contains approximately 400 Federal Supply Class 9150 (Oils and Greases, Cutting, Lubricating and Hydraulic) National Stock Numbers (NSNs) which the Army uses. Of these NSNs, many are non-standard (proprietary) products, which is contrary to the stated Army and DOD policy. In addition, whenever new equipment is introduced, new product NSNs are often created because of manufacturers' claims that specific products must be used. Since this new equipment typically can have a life cycle of 10 to 20 years, these non-standard products are very difficult, if not impossible, to eliminate from the system.

II. APPROACH

A preliminary examination of technical documents revealed that there were approximately 700 to 800 LOs and hundreds of TMs. Within these documents, about one-hundred different lubricants were specified including many non-standard products. Such a large number of documents is more readily handled by computer than by human analysis, and, therefore, a data base system was selected. The system selected was an advanced user-friendly system which is very flexible in terms of its capability. The INFO data base manager program on the PRIME computer was used, since it was available and is easily programmed. The basic programs and operating routines were written by the

Information Management Directorate, Information Systems Division of the RD&E Center. The data base is managed by the Fuels and Lubricants Division of the Materials, Fuels, and Lubricants Laboratory. Once the initial data entry is completed, it will be updated and maintained by the Fuels and Lubricants Division on a semiannual or quarterly basis, using a report format.

III. SYSTEM DESCRIPTION

The operating system contains LO information listed by LO number. The date, proponent, nomenclature, and lubricants are listed for each LO. The LO number gives the branch of the service for the equipment (see Table 1).

TABLE 1. Lubrication Order Branches

BRANCH	
Engineer	
Ordnance	
Quartermaster	
Signal	
Transportation	

The first set of digits gives the Federal Supply Code number for the item (e.g., 2300 for trucks and truck tractors, 1905 for combat ships and landing vessels). The next set of digits is the unique item number for the piece of equipment. The next two digits reflect the level of maintenance for which the document is to be used. The number "1" denotes operator maintenance, whereas the number "2" corresponds to activities of the first shop (i.e., the second level of maintenance). A combination of numbers such as "-23" designates that the maintenance would be preformed in the first or second shops. Thus, LO 5-6675-322-12 is an engineer item (FSC 6675 refers to drafting, surveying, and mapping instruments), item number 322, and the maintenance called for in the LO is to be done by the operator (1) or the first shop (2).

The data about each LO or TM is entered manually and must be verified for accuracy. This information includes LO number, publication date, proponent, M-number, and lubricants called out. In the future, additional programs can be written to examine the data in various ways, or this can be done manually. Each item, LO, or TM (or other document such as a specification) is like a hard copy file. The data base is like a file cabinet, except that one can obtain various types of information. For example, "selecting" the data base puts all of the LOs into the working area (i.e., the file is open). Resclecting for LO number (or other parameter) puts that group of files into work space. Multipl. selections, such as all LOs with the U.S. Army raik-Automotive Command (TACOM) as the proponent, will return the files which contain all of the information in those files. All the LOs by TACOM, for instance, would be available; and these would include the LO numbers, dates, lubricants, etc. One more selection would leave only those files containing the LOs by TACOM which call out Grease, Automotive, and Artillery (GAA).

The INFO data base system allows the user to select records of data and reselect, compute, or otherwise act on that data. For example, selecting "LUBEBASE" returns all LO records (the numbers, dates, etc.). By reselecting for the proponent to contain the string "MICOM," all LOs with the U.S. Army Missile Command (MICOM) as the proponent would be selected. This process can be used to sort through the records by proponent, date, etc. One program can order the LOs by increasing or decreasing age, and then reselect for proponent to find out which proponent has the oldest LOs. Also, the lubricants and M-numbers can be selected. For example, reselecting "REFERENCE!" to contain "M1" would return the LO for the M1 Abrams Tank. Similarly, reselecting for the military symbol (i.e., REFERENCE!) to contain GAA would list all of the LOs which call out GAA. A very large number of combinations of these reselections can be performed to analyze the data from different perspectives.

IV. ANALYSIS OF THE DATA

Table 2 gives the results of an analysis obtained by running a program to reselect LOs by age and is broken down into 30-, 20-, and 10-yr-old groups for each proponent, as of March 1981.

TABLE 2. Data Analysis

Lubrication Orders over 30 years old, by proponent:

COMMAND	NUMBER OF DOCUMENTS
CECOM	1
TACOM	2
TROSCOM	4

Lubrication Orders over 20 years old, by proponent:

COMMAND	NUMBER OF DOCUMENTS
AMCCOM	2
CECOM	8
MICOM	10
TACOM	48
TROSCOM	46 .

Lubrication Orders over 10 years old, by proponent:

COMMAND	NUMBER OF DOCUMENTS
AMCCOM	21
CECOM	9
MICOM	20
TACOM	274
TROSCOM	182

TOTAL: 506 or 68.1 percent were over 10 years old in 1981.

There has been a tremendous amount of activity in the preparation of LOs for new equipment and equipment already in the field. Many LOs have been consolidated or deleted, and some have been added. Other examples of analyses which are possible are: the number of LOs by proponent, by branch within the Army, by both proponent and branch, the number of LOs containing non-standard products, the LOs with incorrect lubricants or symbols, and the lubricants used by a specific piece of equipment (i.e., M1 tank). An analysis can be done when a product is introduced or canceled, as in the recent cancellation of a ball and roller bearing grease, MIL-G-18709. The LOs using this grease would be listed, and the proponents would be notified, specifically, of this cancellation and of substitute products. The data base also can be adapted to the aircraft aviation TMs which contain lubrication charts and other information. The initial age survey was performed using data which is now almost four years old, and many LOs have changed. Their total number is currently around 625. This very rapid change (256 commented on; over 100 deleted)

has caused an editing problem due to the frequency of meaningful updates and other changes. The data base, as originally designed, cannot be changed significantly, and proper initial design is of fundamental importance. When originally developed, this data base contained several relational files. These files are like little data bases. One such file was the lubricants file. This was constructed to handle lubricant properties in addition to being keyed to specific LOs. Thus, while attempting to solve one problem (the use of non-standard products), another was created; and this part of the data base breame cumbersome and was not pursued due to the advent of another approach altogether (the use or modification of a lubricants data base, DOD-STD-35-112(MI)), eliminating the need for a relational lubricants file and invalidating this portion of the data base. The lubricants are simply being added to the main data base without using a relational file structure. This problem was not anticipated, and it was decided that a less-sensitive means should be used to construct and complete the data base so that all of the information available can be readily accessed.

Over the past few years, personal computers have become increasingly popular and sophisticated, and many types of software are available for them. Since this laboratory has recently obtained personal computers, it was decided to use the LOs file as a base for the development of a prototype data base on a personal computer. In this way, any needed information or changes could be made rather easily (and inexpensively). Although the system is not nearly as sophisticated or as capable as the INFO system of the PRIME computer, this decision was made so that all of the problems in the system could be worked out on a system of manageable proportions. In order to handle this large data set on a personal computer, the information was placed onto floppy discs in groups of LO 3 and 5, LO 9, LO 10 and 11, and LO 55, so that four discs and report cycles are needed. The data entry is similar to the PRIME, but various options of format and content can be used. For example, Table 3 gives the parameters or items for each LO input into the system. Each set of LOs, as shown in Table 4, uses this format.

TABLE 3. Format of Lubrication Order Data

ITEM	SPACES ALLOWED
Lubrication Order Number	20
Lubrication Order Date	5
Lubrication Order Name	10
Proponent	. 7
In-House? (Y or N)	1
Lube 1	3
Lube 2-17	10 (100)

TABLE 4. Lubrication Orders by Proponent Command

COMMAND	_LO 3 & 5	LO 9	LO 10 & 11	LO 55	TOTA
AMCCOM	11	29	0	0	40
CECOM	0	0	11	0	11
MICOM	3	· 29	0	0	32
TACOM	177	46	49	0	272
TROSCOM	143	0	25	104	272
Total	334	104	85	104	627

Similarly, Tables 5, 6, and 7 show the LOs by proponent and branch for LOs more than 30, 20, and 10 years old

TABLE 5. Lubrication Orders Over 30 Years Old

COMMAND	LO 3 & 5	LO 9	LO 10 & 11	LO 55	TOTA
AMCCOM	0	0	0	0	0
CECOM	0	0	4	0	4
MICOM	0	0	0	0	0
TACOM	1	1	0	0	2
TROSCOM	1	0	0	2	3
Total	2	1	4	2	9

TABLE 6. Lubrication Orders Over 20 Years Old

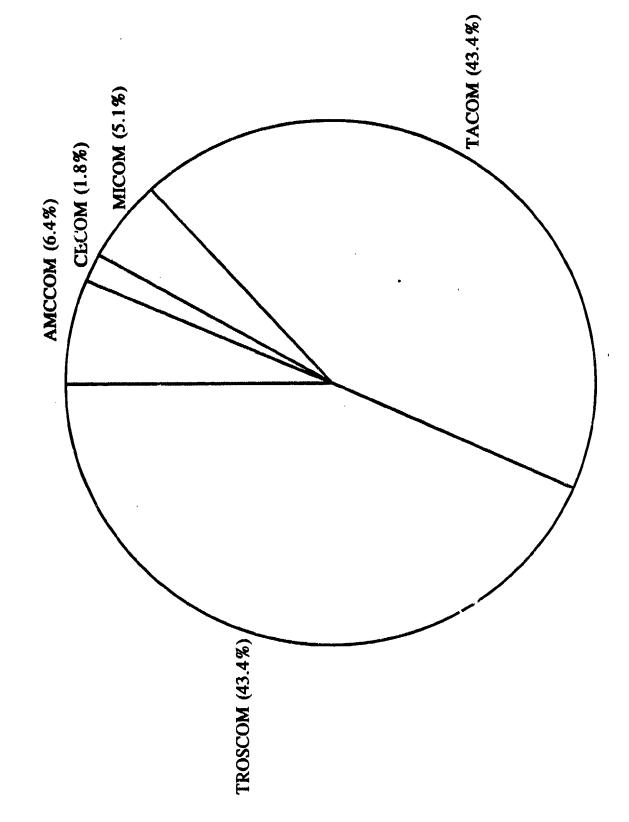
COMMAND	LO 3 & 5	LO 9	LO 10 & 11	LO 55	TOTA
AMCCOM	3	3	0	0	6
CECOM	0	0	8		8
MICOM	0	4	0	0	4
TACOM	36	4	7	0	47
TROSCOM	8	0	1	40	49
Total	47	11	16	40	114

TABLE 7. Lubrication Orders Over 10 Years Old

COMMAND	LO 3 & 5	LO 9	LO 10 & 11	LO 55	TOTA
AMCCOM	8	19	0	0	7
CECOM	0	0	9	0	9
MICOM	3	11	0	0	14
TACOM	109	10	20	0	139
TROSCOM	54	0	22	98	174
Total	174	40	51	98	363

The cross-reference to equipment M-numbers was not put into this system, since less than 100 LOs specify an M-number, or numbers, and the computer space needed to accommodate them would be prohibitive. One problem with this approach is how to search for a given lubricant, since some LOs have as many as 17 different lubricants listed. The problem of how to put this information into the system depends on how this information will ultimately be used. For example, engine oil designated by the symbol "OE/HD030" was "OE30". The LOs which specify this must be changed, and put it into the data base. Since both designations describe the same product, it would be necessary to have them both available when a selection is made. For instance, "it is desired to select all of the LOs which contain 30 weight engine oil, the search must be made for two products oss 16 fields (or 32 searches), and this would be a very inefficient search process. Therefore, in this work, the products will be entered with the correct military symbols when the data is entered, and the LOs with the incorrect designations will be flagged and a comment sent to the proponent to correct the deficiency. Also, in order to facilitate search routines and minimize the number of routines needed, all lubricants, except GAA grease, will be entered into a single field (in the final data base) so that the data is more readily accessible. This is why the LUBE 2-17 is first shown as 10 characters and then compressed to only a single field of 100 characters. Thus, a single search will retrieve the LOs calling out GAA, and a single search will find any other lubricant. The LOs with proprietary products, or other deficiencies, will be flagged for comment.

This prototype set of data bases was constructed (Figure 1), and Table 4 shows the LOs by proponent and branch of the Army using the groups described above.



Appendix A contains a listing by LO number of all the LOs for each branch of the Army as well as a listing of all LOs by proponent. Appendix B contains the detailed listing of the LOs as listed in Tables 5, 6, 7. Table 8 and Figures 2 thru 7 show a comparison of the 1981 and 1985 analyses. Table 8 also gives the percentage of the total LOs which are over 30, 20, and 10 years old.

Table 8. Comparison of 1981 and 1985 Analyses

Lubrication Orders over 30 years old, by proponent:

COMMAND	No. of Documents - 1981	No. of Documents - 1985
AMCCOM	0	0
CECOM	1	4
MICOM	. 0	0 .
TACOM	2	2
TROSCOM	4	. 3
Total	7 (0,9 %)	9 (1.4 %)

Lubrication Orders over 20 years old, by proponent:

COMMAND	No. of Documents - 1981	No. of Documents - 1985
AMCCOM	2	6
CECOM	8	8
MICOM	10	4
TACOM	48	47
TROSCOM	46	49
Total	114 (15.3 %)	114 (18.2 %)

Lubrication Orders over 10 years old, by proponent:

COMMAND	No. of Documents - 1981	No. of Documents - 1985
AMCCOM	21	27
CECOM	ş	9
MICOM	20	14
TACOM	274	139
TROSCOM	182	174
Total	506 (68.1 %)	363 (57.9 %)

Figure 2. Lube Orders Over 30 Years Old, by Proponent, 1981.

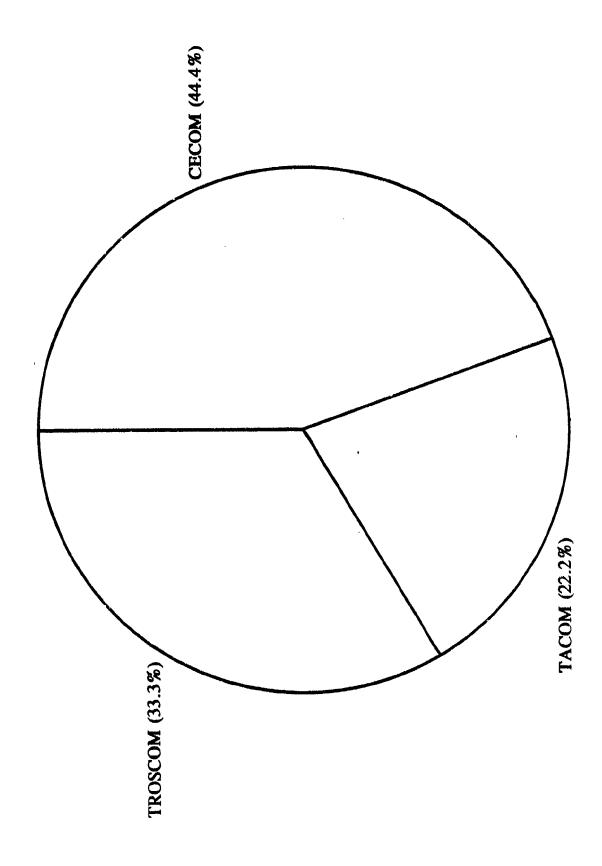
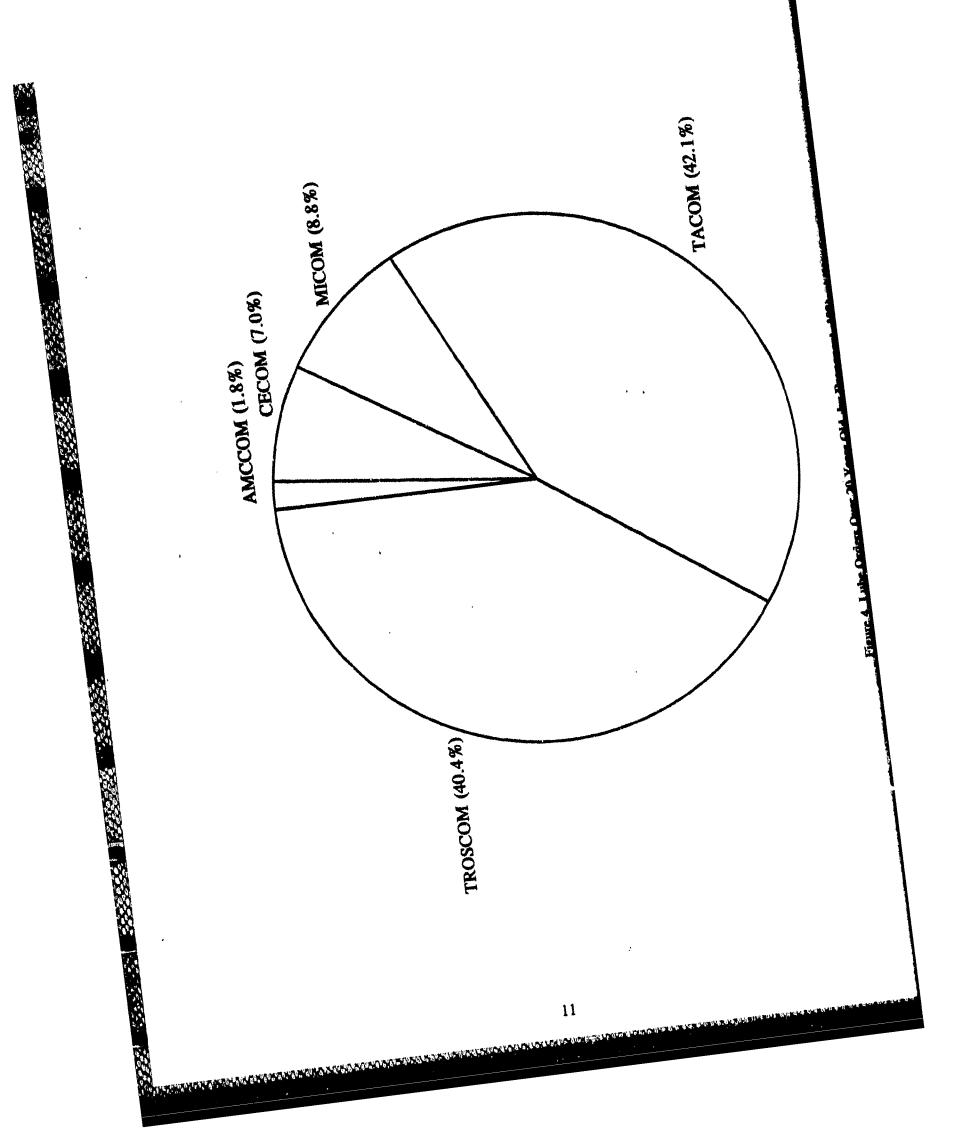


Figure 3. Lube Orders Over 30 Years Old, by Proponent, 1985.



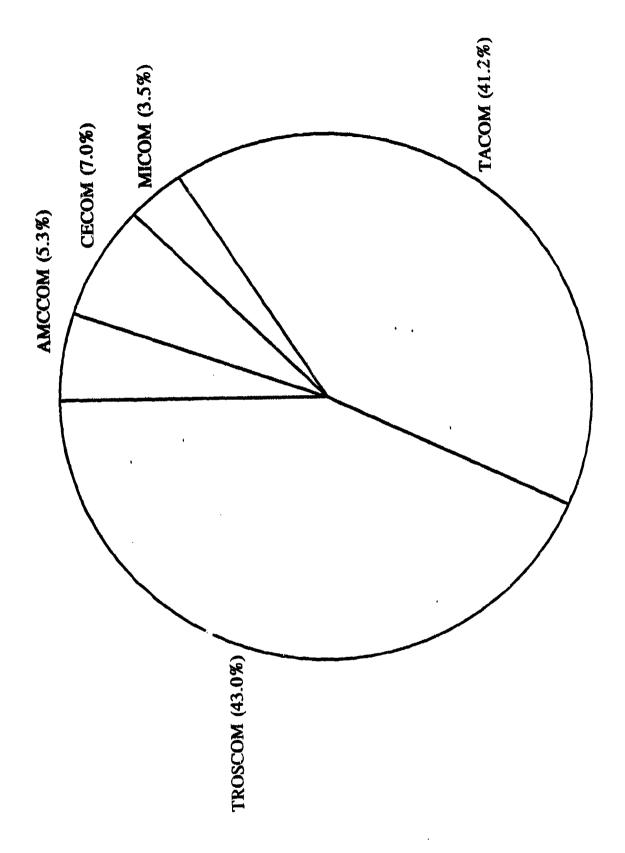
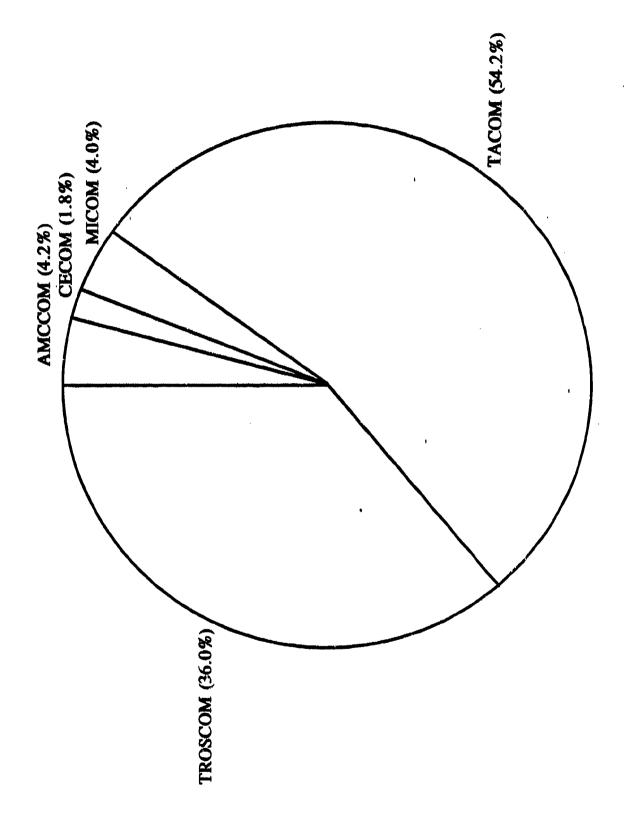
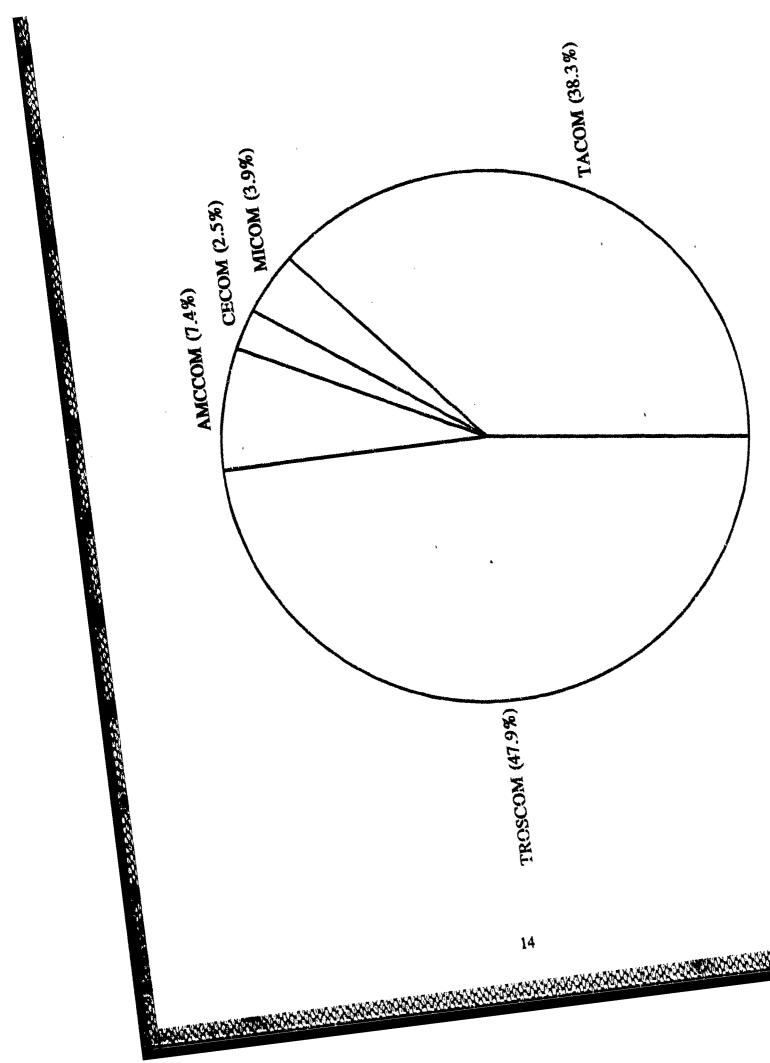


Figure 5. Lube Orders Over 20 Years Old, by Proponent, 1985.





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Figure 7. Lube Orders Over 10 Years Old, by Proponent, 1985.

It is significant to note that, although a very great number of LOs have been commented on (over 256), or were deleted (over 100), there is an increase in the oldest categories and only a modest drop in the most recent categories. The reason for this is that there have been many new LOs added to the system while, as time passes, the older categories actually increase slightly. Note that the 10-year-old category has only a slightly-lower percentage of LOs as compared to the earlier analyses, but that the total number of LOs is very much lower. A great many LOs have been deleted from the system, most of which were between 10 and 20 years old. This represents a very real improvement in the status of the LOs, but much work still remains to be done, and an objective must be specified, such as the complete updating of all LOs so that none are over 10 years old.

Table 9 shows all (LO 9) FSG 2300 item LOs and contains all 2300 series items including trucks, tanks, trailers, etc. The table was prepared by selecting the LOs which contained "LO9-23" in the LO number field. Similarly, if "LO 9-2320" is selected on this same field, all tactical trucks are listed; and this is shown in Table 10. If the string "Tank" is selected in the same field, Table 11 is the result. This table gives all of the LOs in the system for Tanks (M48, M60, M1).

Table 9. Lube Orders For FSG 2300 Tactical Vechicles

NUMBER	DATE	NAME	FROF
	190 197/17 0 197/17 0 199/17 10 199/17 1	CKKK CKU CK IR CUCK CKU CK IR CUCK CK CK IR CUCK CK CK IR CKK	COMMENS OF THE TERMS OF THE TER

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Table 10. Truck Lube Orders

NUMBER	DATE	HAME	PROP
LO 9-2320-206-12	1976/7	10 T TRUCK	TACOM
LO 9-2320-209-12-1	1983/4	21/2 TRUCK	TACOM
LO 9-2320-218-12	1983/10	1/4T TRUCK	TACOM
LO 9-2320-230-12	1971/1	5T TRUCK	TACOM
LO 9-2320-233-12	1984/8	8T TRUCK	TACOM
LO 9-2320-242-12	1982/6	11/4T TRUC	TACOM TACOM TACOM TACOM TACOM
LO 9-2320-246-12	1988/6	1/2T TRUCK	
LD 9-2320-258-12	1982/3	221/2T TRU	
LD 9-2320-250-12	1983/11	5T TRUCK	
LO 9-2320-266-12	1981/12	11/4T TRUC	
LO 9-2320-269-12	1983/10	TELE TRUCK	TACOM
LO 9-2320-270-12	1984/1	TRUCK	TACOM
LO 9-2320-272-12	1985/3	5T TRUCK	TACOM
LO 9-2320-273-12	1983/1	TRUCK	TACOM
LO 9-2320-282-12	1983/6	10T TRUCK	TACOM
LO 9-2320-283-12	1983/6	TRUCK	TACOM
LO 9-2320-289-12	1983/7	11/4T TRUC	TACOM

Table 11. Tank Lube Orders

NUMBER	DATE	NAME	PROP
LO 9-2350-215-12 LO 9-2350-232-12 LO 9-2350-253-12 LO 9-2350-255-12 LO 9-2350-257-12 LO 9-2350-258-12	1983/12 1973/12 1983/9 1981/11 1984/3 1983/12	TANK TANK TANK TANK TANK TANK	TACOM TACOM TACOM TACOM TACOM TACOM
In 9-2350-260-12	1983/11	TANK	TACOM

V. SUMMARY AND CONCLUSIONS

The first phases of the development of a lubricants data base have been completed, and very useful information has been generated. The fact that 68.1 percent of all LOs were found to be over 10 years old when this project began, and 57.9 percent are still over 10 years old, is significant. The projected lifetime for most equipment is usually 10 years, but most of the time it is actually closer to 20 years. The increase in the useful life must involve the updating of information--particularly, the routine maintenance functions, or the equipment will, very likely, not be properly maintained. Due to developments in other areas, the original data base structure, including relational files, is no longer valid. The M-numbers should be a separate mini-data base, while the lubricants should be entered in a single field of 100 to 150 characters. This new structure will optimize computer space, while still allowing a useful analysis of the information.

While a great deal of activity has occurred with respect to the status of the Army LOs (particularly by TACOM), over half of the current LOs are over 10 years old. This age should be the maximum, and validation or revision should take place at 5-year intervals, not 10 (or 20 or 30). Although this may seem a tremendous undertaking, the LOs which call out incorrect lubricants, or have other deficiencies, will be flagged during final data entry phase and will be commented on at that time.

APPENDIX A LUBE ORDERS BY PROPONENT AND NUMBER LO 3,5 SERIES

NUMBER	DATE	NAME	PROP
LO 3-1040-204-30 LO 3-1040-211-30 LO 3-1040-225-12 LO 3-1040-225-12 LO 3-1040-225-12 LO 3-1040-256-12 LO 3-1040-256-12 LO 3-1040-256-12 LO 3-1040-260-12 LO 3-1040-2007-12 LO 3-1040-2007-12 LO 3-1054 LO 5-1161-12 LO 5-1165-1 LO 5-1165-1 LO 5-1165-1 LO 5-1165-1 LO 5-1169-200-200-12 LO 5-1169-200-200-12 LO 5-1169-200-200-12 LO 5-1169-200-12 LO 5-1169-12 LO	1973/8 1973/9 1976/9 1976/9 1976/9 1976/9 1996/9 19	H. TORR H. P.	MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM

ころしな ちょうとうかかかり 一世のないないないないないない こうしゅんかん しょうしょう こうしん こうしん こうしん こうしん こうしん こうしょう かんしん こうしゅう こうしゅう こうしゅう こうしゅう こうしゅう

NUMBER	DATE	NAME	PROP
LO 5-2805-256-12 LO 5-2805-258-12 LO 5-2805-259-12 LO 5-2805-259-12 LO 5-2805-261-12 LO 5-2805-261-12 LO 5-3431-209-15 LO 5-3431-209-15 LO 5-3610-253-12 LO 5-3655-211-12-1 LO 5-3655-211-12-1 LO 5-3655-211-12-2 LO 5-3655-211-12-2 LO 5-3655-211-12-1 LO 5-3655-209-15-1 LO 5-3805-209-15-1 LO 5-3805-209-15-2 LO 5-3805-209-15-2 LO 5-3805-219-12-1 LO 5-3805-249-12-1 LO 5-3805-249-12-1 LO 5-3805-249-12-1 LO 5-3805-246-12-1 LO 5-3805-246-12-1 LO 5-3805-246-12-1 LO 5-3805-246-12-2 LO 5-3805-246-12-1 LO 5-3805-246-12-2 LO 5-3805-246-12-2 LO 5-3805-246-12-2 LO 5-3805-246-12-1	1978/7 1978/6 1978/10 1978/10 1978/10 1978/10 1978/10 1982/8 1967/10 1983/11 1983/12 1968/13 1971/12 1966/7 1966/7 1966/7 1966/7 1966/7 1968/11 1968/11 1968/11 1968/11 1968/11 1968/11 1968/11 1968/11 1968/11 1968/11 1968/11 1968/11 1968/12	TCCCPPONT. TCCCPPONT. TCCCPPONT. TCCCPPONT. TCCCPPONT. TARRER REFERENCE	TROSCOM MEMORE TROSCOM MEMORE COMMENTATION OF TROSCOM MEMORE C

NUMBER	DATE	MAME	PROP
LO 5-3805-249-12-3 LO 5-3805-250-12 LO 5-3805-251-12 LO 5-3805-251-12-1 LO 5-3805-252-12-3 LO 5-3805-252-12-3 LO 5-3805-252-12-4 LO 5-3805-252-12-4 LO 5-3805-252-12-4 LO 5-3805-252-12-12 LO 5-3805-252-12-12 LO 5-3810-206-12-2 LO 5-3810-206-12-5 LO 5-3810-206-12-5 LO 5-3810-207-200-2 LO 5-3810-207-200-2 LO 5-3810-225-15-1 LO 5-3810-225-15-2 LO 5-3810-225-15-1 LO 5-3810-225-15-1 LO 5-3810-225-15-1 LO 5-3810-225-15-1 LO 5-3810-233-12-1 LO 5-3810-233-12-12-1 LO 5-3810-233-12-12-12-12-12-12-12-12-12-12-12-12-12-	1972/1 1983/12 1983/12 1983/12 1983/13 19978/13 19978/13 19971/3 19971/3 19971/3 19971/3 19971/3 19971/3 19971/3 19964/1 19964/1 19964/1 19964/1 19964/7 19984/7 19984/7 19984/7 19984/7 19984/7 19984/7 19984/7 19984/7 19984/7 19984/7 19984/7 19984/7 19984/7 19984/7 19984/7 19984/7	COCCOCCOCCOCCOCCOCCOCCOCCOCCOCCOCCOCCOC	TTACCOMM MM

NUMBER	DATE	NAME	PROP
LO 5-3820-238-12-2 LO 5-3820-239-12 LO 5-3820-241-12 LO 5-3820-242-12 LO 5-3825-202-20 LO 5-3825-209-12 LO 5-3825-213-20-2 LO 5-3825-213-20-3 LO 5-3825-213-20-3 LO 5-3825-223-12 LO 5-3825-223-12 LO 5-3895-215-12 LO 5-3895-219-12 LO 5-3895-219-12 LO 5-3895-243-20-1 LO 5-3895-259-12 LO 5-3895-263-12 LO 5-3895-263-12 LO 5-3895-263-12 LO 5-3895-271-12 LO 5-3895-271-12 LO 5-3895-271-12 LO 5-3895-273-12 LO 5-3895-273-12 LO 5-3895-273-12 LO 5-3895-273-12 LO 5-3895-273-12 LO 5-3895-273-12	1968/10 1983/12 1984/4 1984/3 1959/12 1961/10 1961/10 1961/10 1961/10 1961/10 1961/10 1963/11 1963/11 1984/1 1984/1 1963/10 1963/10 1963/10 1963/12 1963/12 1983/12 1983/12 1983/12 1984/7 1984/7	CH TE ARCHITE MARCH TO ARCHITE MARCH TO ARCHITE MARCH TE ARCHITE MAR	MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
LO 5-3895-330-12 LO 5-3895-331-12-1	1983/12 1970/12	SPREADER FISHER	TACOM TACOM

HUMBER	DATE	NAME	PROP
LO 5-4310 - 2224 - 122	194/1 1984/1 1984/1 1984/1 1984/1 1984/1 1983/1 1983/1 1983/1 1983/1 1983/1 1983/1 1983/1 1983/1 1983/1 1983/1 19865/1 1986/1 1986/1 1986/1 1986/1 1986/1 1986/1 1986/1 1986/1 1986/1 1986/1 1986/1 1987/1 1 1987/1 1 1987/1 1 1987/1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	RRREDE SOORRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRR	TACOM MANAGEMENT TACOM

NUMBER	DATE	NAME	PROP
LO 5-4310-12 LO 5-43200-216-12 LO 5-43200-216-12 LO 5-43200-2226-12 LO 5-43200-2334-12 LO 5-43200-2334-12 LO 5-43200-2337-12 LO 5-43200-235-12 LO 5-43200-255-12 LO 5-43200-255-12 LO 5-43200-255-12 LO 5-43200-255-12 LO 5-43200-255-12 LO 5-43200-255-12 LO 5-43200-223-12 LO 5-43200-223-12 LO 5-44320-223-12 LO 5-46100-223-12 LO 5-54200-203-12 LO 5-54200-218-12 LO 5-54200-218-12 LO 5-54200-218-12 LO 5-54200-218-12 LO 5-54200-218-12 LO 5-54200-218-12 LO 5-54200-218-12 LO 5-54200-218-12 LO 5-54200-12-12 LO 5-54200-218-12 LO 5-54200-12-12 LO 5-54200-12-12	1978/5 1978/5 1978/5 1978/5 1978/5 1978/5 1978/5 1977/5 19	RESERVED SERVED	TROSCOMM MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM

NUMBER	DATE	NAME	PROP
LO 5-6115-585-12	19655/12 1975/21 19655/17 1975/21 19775/21 19775/21 199775/21 199775/21 199775/21 199775/21 199775/21 199775/21 199775/21 19983333333332 1998332/21 1998333333332 199833333333332 199833333333332 1998333333333332 199833333333333332 199833333333333333333333333333333333333	RRRRRRRRRRRRRRRRRNE OOOONOONOONOONOONOONOONOONOONOONOONOON	TROSCOOMM MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM

LO 9 SERIES

LO 9 SERIES

NUMBER	DATE	NAME	PROP
LO 9-2300-257-12 LO 9-2320-206-12 LO 9-2320-209-12-1 LO 9-2320-211-12 LO 9-2320-230-12 LO 9-2320-230-12 LO 9-2320-246-12 LO 9-2320-246-12 LO 9-2320-260-13 LO 9-2320-260-12 LO 9-2320-260-12 LO 9-2320-260-12	190 3/180 3/180 3/180 3/180 3/180 3/180 3/180 3/180 3/180 199 199 199 199 199 199 199 199 199 19	E KK K CKU CK T CK C C C C C C C C C C C C C C C C C C	MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM

LO 9 SERIES

NUMBER	DATE	MAME	FROF
LO 9-2350-300-13 LO 9-2350-303-12 LO 9-2350-304-12 LO 9-2590-213-12 LO 9-4910-261-12 LO 9-4935-500-12 LO 9-4935-587-12 LO 9-767 LO 9-9502-4-1 LO 9-9502-4-2	1977/6 1981/1 1984/12 1970/6 1970/10 1970/1 1971/3 1946/9 1957/10	AIR DEF AR SP HOW SP HOW BULLDOZER JACK HAWK CHAPPARAL TRAILER CARRIER SERV.	AMCCOM AMCCOM TACOM AMCCOM MICOM MICOM TACOM MICOM MICOM

LO 10,11 SERIES

NUMBER	DATE	NAME	PROP
Loid-3950-206-12 Loid-3530-202-10-3 Loid-3530-202-10-3 Loid-3530-202-10-3 Loid-3530-202-10-5 Loid-3530-202-10-5 Loid-3530-202-10-5 Loid-3530-202-10-5 Loid-3530-202-10-5 Loid-3530-203-10-4 Loid-3530-203-10-4 Loid-3530-203-10-4 Loid-3530-203-10-4 Loid-3530-203-10-12 Loid-3530-203-10-12 Loid-3930-225-20-12 Loid-3930-235-12 Loid-3930-235-12 Loid-3930-235-12 Loid-3930-242-12 Loid-3930-255-20	1996557/100 1996555//100 1996555//100 1996555//100 1996555//100 1996655//100 1996655//100 1996666//100 199665//100 1996666//100 1996666//100 1996666//100 199666//	TYCOCOCCEREES FITTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTTT	MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM

LO 10,11 SERIES

NUMBER	DATE	NAME	PROP
NUMBER L010-3930-622-12-2 L010-3930-623-12 L010-3930-625-12 L010-3930-626-12 L010-3930-626-12 L010-3930-626-12 L010-3930-630-12 L010-3930-631-12 L010-3930-638-12 L010-3930-638-12 L010-3930-638-12 L010-3930-638-12 L010-3930-638-12 L010-3950-203-12-1 L010-3950-203-12-1 L010-3950-201-20-1 L010-3950-201-20-1 L010-7360-201-20-2 L010-7360-201-20-6 L010-7360-201-20-6 L010-7360-201-20-6 L011-1335 L011-2350 L011-2350 L011-2560-1 L011-3560-1 L011-3560-1 L011-3560-1 L011-3560-1 L011-3560-1 L011-3560-1 L011-3560-1 L011-3560-1 L011-3560-1	DATE 1922 199844441212 1998844441212 199888944441212 19988898898112 199888988898112 19988898888888888	TTTTT TTTTT TT S IFFT AGG IFFT TTTTTT TT KKKKKKK CLLLL TTTGIII KKKKKKKK CLLLL TTTGIII KROCKKKKKK CLLL TTTGIII KROCKKKKKKK CLLL TTTGIII KROCKKKK CLLL TTTGIII KROCKKK CLLL TTTGIII KROCKK CLLL TTTGIII	P
L011-5840-292-20 L011-5840-354-20 L011-5840-355-20	1969/2 1983/5 1981/9	RADAR RADAR RADAR	CECOM CECOM CECOM

LO 55 SERIES

HUMBER	DATE	NAME	PROP
L055-1905-201-12	1959/3	LAND CRAFT	TROSCOM
L055-1905-202-12-1	1974/9	LAND CRAFT	TROSCOM
L055-1905-202-12-2	1974/9	LAND CRAFT LAND CRAFT	TROSCOM TROSCOM
L055-1905-202-12-3 L055-1905-203-12-1	1974/9 1983/6	LAND CRAFT	TROSCOM
L055-1905-203-12-2	1972/3	WINCH	TROSCOM
L055-1905-217-12-1	1980/11	LAND CRAFT	TROSCOM
L055-1905-217-12-2	1980/11	LAND CRAFT	TROSCOM
L055-1905-217-12-3	1971/7	LAND CRAFT	TRUSCOM
L055-1905-219-12	1978/7	LAND CRAFT	TROSCOM
L055-1925-201-12-1	1965/8	TUG	TROSCOM TROSCOM
L055-1925-201-12-2 L055-1925-202-12-1	1965/8 1974/6	TUG TUG	TROSCOM
L055-1925-202-12-1	1974/6	TUG	TROSCOM
L055-1925-202-12-10	1974/6	ĊĂLIBR	TROSCOM
L055-1925-202-12-3	1974/6	TUG	TROSCOM
L055-1925-202-12-4	1974/6	TUG	TROSCOM
L055-1925-202-12-5	1974/6	TUG	TROSCOM
L055-1925-202-12-5	1974/6	TUG TUG	TROSCOM TROSCOM
L055-1925-202-12-7 L055-1925-202-12-8	· 1974/6 1974/6	TUG	TROSCOM
L055-1925-202-12-9	1974/6	TÜĞ	TROSCOM
L055-1925-204-12-1	1973/10	ŤŪĞ	TROSCOM
L055-1925-204-12-2	1973/10	TUG	TROSCOM
L055-1925-204-12-3	1973/10	TUG	TROSCOM
L055-1925-204-12-4	1973/10	TUG	TRUSCOM
L055-1925-204-12-5	1973/10 1973/10	TUG TUG	TROSCOM TROSCOM
L055-1925-204-12-6 L055-1925-204-12-7	1973/10	TUG	TROSCOM
L055~1925~204~12~6	1973/10	TŬĞ	TROSCOM
L055-1925-205-12-1	1973/12	ŤŪĞ	TROSCOM
L055-1925-205-12-2	1973/12	TUG	TROSCOM
L055-1925-205-12-3	1973/12	TUG	TROSCOM
L055-1925-205-12-4	1973/12	TUG	TROSCOM TROSCOM
L055-1925-205-12-5 L055-1925-205-12-6	1973/12 1973/12	TUG TUG	TROSCOM
L055-1925-205-12-7	1973/12	TUG	TROSCOM
L055-1925-205-12-8	1973/12	ŤŪĞ	TROSCOM
L055-1930-202-12/1	1964/12	BARGE	TROSCOM
L055-1930-202-12/2	1964712	BARGE	TROSCOM
L055-1930-202-12/3	1964/12	BARGE	TROSCOM
L055-1930-202-12/4	1964/12	PARGE	TROSCOM TROSCOM
L055-1930-202-12/5 L055-1930-203-12-1	1964/12 1971/4	BARGE LARC	TROSCOM
L055-1930-203-12-1	1969/9	LARC	TROSCOM
L055-1930-203-12-3	1969/9	LARC	TROSCOM
L055-1930-203-12-4	1969/9	LARC	TROSCOM

LO 55 SERIES

L055-1930-205-12-1 1968/5 LARC TROSCOI L055-1930-205-12-2 1968/5 LARC TROSCOI L055-1930-206-12-1 1969/5 LARC TROSCOI L055-1930-206-12-2 1969/12 LARC TROSCOI L055-1930-206-12-3 1969/5 LARC TROSCOI L055-1930-206-12-3 1969/5 LARC TROSCOI L055-1930-206-12-5 1969/5 LARC TROSCOI L055-1930-206-12-5 1969/5 LARC TROSCOI L055-1930-206-12-5 1969/5 LARC TROSCOI L055-1935-201-12 1968/1 CRANE BAR TROSCOI L055-1935-201-12 1968/5 CRANE BAR TROSCOI L055-1935-201-12 1968/5 CRANE BAR TROSCOI L055-1940-201-12 1968/5 CRANE BAR TROSCOI L055-1940-201-12 1968/2 BOAT TROSCOI L055-1940-203-12 1964/12 BOAT TROSCOI L055-1940-203-12 1964/12 BOAT TROSCOI L055-1940-203-12 1966/3 BOAT TROSCOI L055-1940-203-12 1966/3 BOAT TROSCOI L055-2019 1959/4 RAILWAY TROSCOI L055-2019 1959/4 RAILWAY TROSCOI L055-2019-200 1959/2 L0COMOTIVE TROSCOI L055-2210-204-20 1959/2 L0COMOTIVE TROSCOI L055-2210-204-20 1959/8 L0COMOTIVE TROSCOI L055-2210-204-20 1959/8 L0COMOTIVE TROSCOI L055-2210-206-20 1959/8 L0COMOTIVE TROSCOI L055-2210-206-20 1959/8 L0COMOTIVE TROSCOI L055-2210-206-20 1959/8 L0COMOTIVE TROSCOI L055-2210-208-20 1959/8 L0COMOTIVE TROSCOI L055-2210-208-20 1959/8 L0COMOTIVE TROSCOI L055-2210-208-20 1959/8 L0COMOTIVE TROSCOI L055-2210-210-20 1959/8 L0COMOTIVE TROSCOI L055-2220-210-12-1 1966/9 RAILWAY TROSCOI L055-2220-210-12-1 1966/9 RAILWAY TROSCOI	NUMBER	DATE	HAME	PROF
LO55-2230-201-12-1	L055-1930-205-12-1 L055-1930-206-12-2 L055-1930-206-12-3 L055-1930-206-12-3 L055-1930-206-12-3 L055-1930-206-12-4 L055-1930-206-12-5 L055-1930-206-12-12 L055-1930-201-12 L055-1935-201-12 L055-1935-201-12 L055-1940-20 L055-1940-20 L055-1940-20 L055-1940-20 L055-1940-20 L055-1940-20 L055-2019-206-20 L055-2019-206-20 L055-2019-206-20 L055-2019-206-20 L055-2019-206-20 L055-2019-206-20 L055-2019-206-20 L055-2019-216-20	295552 1968/552 1968/552 1968/552 1969/552 1969/552 1969/552 1969/552 19968 19968 19959 19969 19969 19969 19969 19969 19969 19969 19969 19969 19969 19969 19969 19969	LARROCCE BEAR YYTTIVEEE LLO BARROCCC EBBARRATTT WAYTTIVEEL LARROCCOMMOTTIVY ALL LARRAMANT RACCOCCOMMOTTIVY ALL LARRAMANT WAYTTIVEE LARRAMANT WATTIVEE LARRAMANT W	PROF TROSCOM T

LO 55 SERIES

HUMBER	DATE	NAME	PROP
L055-3950-224-12 L055-4014 L055-4320-218-12 L055-4320-230-12/1 L055-4320-230-12/2 L055-4330-202-12 L055-6115-214-12 L055-6115-218-12 L055-6115-218-12	1964/12 1958/11 1961/8 1964/12 1964/12 1964/12 1964/1 1965/8 1964/12	WIDLASS ENGINE PUMP PUMP PUMP LUBE PURIF GENERATOR AUX SET GENERATOR GENERATOR	TROSCOM TROSCOM TROSCOM TROSCOM TROSCOM TROSCOM TROSCOM TROSCOM TROSCOM

APPENDIX B LO 3,5 SERIES, LOS OVER 30 YEARS OLD

NUMBER	DATE	NAME	PROP
LO 5-5065	1954/2	COMPRESSOR	TACOM
LO 5-9427	1 954/ 2	PUMP	TROSCOM

HUMBER	DATE	NAME	PROP
LO 3-1949-211-39 LO 3-4249-297-12 LO 5-3431-299-15 LO 5-1949 LO 5-1154 LO 5-1161 LO 5-1185-1 LO 5-1185-2 LO 5-2419-212-15-2 LO 5-2805-212-29-1 LO 5-3805-212-29-1 LO 5-3819-297-29-2 LO 5-3819-297-29-3 LO 5-3819-297-29-3 LO 5-3819-295-15-4 LO 5-3819-225-15-4 LO 5-3819-225-15-4 LO 5-3819-227-15-2 LO 5-3819-227-15-2 LO 5-3819-227-15-4 LO 5-3819-227-15-2 LO 5-3819-227-15-4 LO 5-3819-227-15-4 LO 5-3895-225-12 LO 5-3895-2265-12	1961/1 1963/4 1963/4 1963/4 19660/7 1960/7 1960/7 1960/7 1961/1 1961/1 1961/1 1964/7 1964/7 1963/1 1964/7 1963/1	LUAR REPRESENTATION OF THE SECOND SEC	AMACCOM AMACCO
LO 5-6115-235-15	1961/3	GENERATOR	TROSCOM

NUMBER	DATE	HAME	PROP
LO 5-6575-201	1959/7	PROJECTOR	TROSCOM
LO 5-9427	1954/2	PUMP	TROSCOM

NUMBER	DATE	NAME	PROP
LO 3-1040-204-30 LO 3-1040-256-12 LO 3-1040-256-12 LO 3-1040-256-12 LO 3-1040-256-12 LO 3-1040-256-12 LO 3-4240-209-12 LO 5-3431-209-15 LO 5-3450-201-15-1 LO 5-1450-201-15-1 LO 5-1450-201-15-1 LO 5-1450-212-15-1 LO 5-1105-1 LO 5-2410-223-12-1 LO 5-2410-223-12-1 LO 5-2410-223-12-1 LO 5-2410-221-12-1 LO 5-3005-201-12-1 LO 5-3005-201-12-2 LO 5-3005-210-12-1	1963/5 1963/5 1963/5 1963/6 1966/10 1966/11 1966/7 1963/14 19663/1 1963/1 1963/1 1963/1 1963/1 1968/9 1966/7 1966/7 1966/7 1966/7 1966/7 1966/1 1966/1 1966/1 1966/1 1966/1 1966/1 1966/1 1966/1 1966/1 1966/1 1966/1 1966/1 1966/1 1966/1 1966/1 1966/1 1966/1	H.I. P.HH H.I. P.H H.I. P.HH H.I. P.H H.I. P.H H.I. P.H H.I. P.H H.I.	OMM MM

	NUMBER	DATE	NAME	PROP
	LO 5-3805-245-12-1 LO 5-3805-246-12-2 LO 5-3805-246-12-3 LO 5-3805-246-12-3 LO 5-3805-246-12-4 LO 5-3805-249-12-3 LO 5-3805-249-12-3 LO 5-3805-249-12-4 LO 5-3805-249-12-4 LO 5-3805-252-12-1 LO 5-3805-252-12-1 LO 5-3805-252-12-1 LO 5-3805-252-12-1 LO 5-3805-206-12-3 LO 5-3810-206-12-4 LO 5-3810-206-12-4 LO 5-3810-206-12-4 LO 5-3810-207-20-1 LO 5-3810-207-20-1 LO 5-3810-225-15-1 LO 5-3810-225-15-1 LO 5-3810-225-15-1 LO 5-3810-225-15-1 LO 5-3810-225-15-1 LO 5-3810-225-15-2 LO 5-3810-225-15-1 LO 5-3810-225-15-2 LO 5-3810-2231-12-2 LO 5-3810-233-12-2 LO 5-3820-238-12-1 LO 5-3820-238-12-1 LO 5-3820-238-12-1 LO 5-3825-223-12-1	1968/2 1968/2 1968/2 1968/2 1968/2 1977/1 1977/2 1977/3 1977/3 1977/3 1977/3 1977/3 1977/3 1961/1 1964/1 1964/1 1966/4 19	RRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRR	MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
A STANDARD BOOK AND A TO	<u> 1. J. J.</u>	<u> </u>	<u>U wa ku ku ku ku ka ka wa ka ka</u>	は異な異な なといっていない。
		the state of the s		

NUMBER	DATE	NAME	FROF
LO 5-3895-243-20-2 LO 5-3895-254-15 LO 5-3895-265-12 LO 5-3895-280-15-1 LO 5-3895-280-15-2 LO 5-3895-280-15-3 LO 5-3895-321-12-1 LO 5-3895-321-12-2 LO 5-3895-322-12-2 LO 5-3895-326-12 LO 5-3895-326-12 LO 5-3895-321-12-1 LO 5-3895-321-12-1 LO 5-3895-331-12-1 LO 5-3895-331-12-2 LO 5-3895-335-12	1967/5 1963/5 1963/5 19667/5 19663/5 19667/5 19966/6 19968/6 19968/6 199776 199776 199776 199776 199776 19977776 19977776 19977776 19977776 19977776 19977776 19977776 199777776 199777776 19977777776 1997777777777	LL LLINT C.R CCCC C.R CCCCC C.R.R.R.R.R.R.R.R.R.R.R.R.R.R.C.C	MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM

NUMBER	DATE	NAM	FROF
L055-6115-214-12	1964/1	GENERATOR	TROSCOM
L055-6115-215-12	1965/8	AUX SET	TROSCOM
L055-6115-218-12	1964/12	GENERATOR	TROSCOM
L055-6115-U210	1964/12	GENERATOR	TROSCOM

NUMBER	1	DATE	NAME	PROP
LO 9-767		1948/9	TRAILER	TACOM

LO 9 SERIES, LOs OVER 30 YEARS OLD

NUMBER	DATE	MAME	PROP
L055-2013	1953/4	RAILWAY	TROSCOM
L055-2019	1 954/ 9	RAILWAY	TROSCOM

NUMBER	DATE	NAME	PROP
LO 9-1055-203-10 LO 9-1055-208-10 LO 9-4910-261-12 LO 9-1400-250-20 LO 9-1430-250-20 LO 9-9502-4-1 LO 9-9502-4-2 LO 9-767 LO 9-2330-208-12 LO 9-2330-222-12	1965/1 1964/10 1960/10 1965/1 1961/11 1957/10 1957/10 1948/9 1963/6	HEAT TIED HANDLING U JACK LAUNCHER R NIKE CARRIER SERV. TRAILER TRAILER TRAILER	AMCCOM AMCCOM MICOM MICOM MICOM MICOM TACOM TACOM
LO 9-2330-269-12	1963/4	TRAILER	TACOM

LO 9-1005-257-12
LO 9-4910-261-12
LO 9-1430-254-20 1971/8 RADAR MICOM LO 9-1430-503-12 1970/1 RADAR MICOM LO 9-1430-510-12 1970/1 RADAR MICOM LO 9-1430-513-12 1970/1 RADAR MICOM LO 9-1440-500-12 1973/7 LAUNCHER MICOM LO 9-4935-500-12 1970/1 HAWK MICOM

LO 10,11 SERIES, LOs OVER 30 YEARS OLD

NUMBER	DATE	NAME	PROP
L011-1335	1953/5	RADAR	CECOM
L011-2396-1	1954/11	CAMERA	CECOM
L011-2568	1952/4	SOUND RANG	CECOM
L011-5507	1954/9	ROTARY CON	CECOM

LO 10,11 SERIES, I Os OVER 20 YEARS OLD

NUMBER	DATE	NAME	PROP
L011-1167-1	1958/1	RADIO	CECOM
L011-1335	1953/5	RADAR	CECOM
L011-2258	1955/3	FAC SET	CECOM
L011-2396-1	1954/11	CAMERA	CECOM
L011-2444	1955/2	WIND REC	CECOM
L011-2568	1952/4	SOUND RANG	CECOM
L011-5047	1959/5	ANT GR	CECOM
L011-5507	1954/9	ROTARY CON	CECOM
L010-3930-215-20	1963/7	TRUCK	TACOM
L010-3930-225-20	1964/1	TRUCK LIFT	TACOM
L010-3930-231-20-1	1964/3	TRUCK LIFT	TACOM
L010-3930-234-20	1964/5	TRUCK LIFT	TACOM
L010-3930-252-12	1963/10	TRUCK LIFT	THCOM
L010-3930-253-12	1963/10	TRUCK LIFT	TACOM
L010-3930-407-20	1963/7	TRACTOR	TACOM
L010-4230-202-15	1964/3	DELOUSING	TROSCOM

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L010-7360-201-20-3	1966/2	BAKERY	TROSCOM
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L010-7360-201-20-5	1966/2	BAKERY	TROSCOM
L010-7360-201-20-6	1966/2	BAKERY	TROSCOM

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